

A
S C H E M E

FOR THE

Restoring and making perfect

THE

N A V I G A T I O N

OF THE

River *W I T H A M*

FROM

Boston to LINCOLN, and also for
draining the Low-Lands and Fens
contiguous thereto.

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of *Spalding*, ENGINEERS.

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S. C. H. E. W.

NAVIGATION

River Navigation



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A SCHEME for the Restoring and making perfect the NAVIGATION of the River WITHAM from Boston to Lincoln, and Draining the Low Lands, and Fenns contiguous thereto.



IN the drawing up of Schemes for the Works of Draining and Navigation, we have always found it highly necessary to collect Historical Facts, of the various States of such Rivers, Drains and Lands, as are proposed for the Subject of Enquiry; for by observing the Consequences following, such Alterations as have been made, either by Nature or Art, for a long Series of Years before; we are the better enabled to come at such Truths, as ought to be our Guide in every Scheme.

Upon these Principles, we find that the antient River *Witham* hath its Spring or
B Head

Head near to a Town called *South Witham* in *Lincolnshire*, and from thence it taketh its Name : From the said Town it glides along in winding Meanders, by *Grantham* to *Barkstone*, where it receives another small Brook ; with that Addition it flows on to *Westborough*, and there takes in another Brook ; from thence it continues its Course by *Beckingham* and *Staplesford* into *Bradon Mere*, on the West-side of the City of *Lincoln*, and by the Way receives the Waters of a third Brook. From *Bradon* the said River runs thro' the City of *Lincoln* to *Stampend*, but in antient times its Course was through *Sincil-Dyke*, as we have been inform'd ; but this we much doubt, for upon our Survey it rather appears to have been a flaker Drain to ease the River thro' the Town in Times of great Freshes coming down. From *Stampend* the River *Witham* continues its Course to the Out-fall of *Berling's Eau*, which is ten Miles and a Half below the City of *Lincoln* along the winding Course of the River ; in this Distance the said River receiveth the Waters of *Washenburgh-Beck*, *Fiskerton-Dyke*, *Greetwell-Syke* and *Berling's-Eau* ; these Waters are fed by divers Springs from their Heads, besides the Waters that fall by Rains on near five thousand Acres of Land, from the Out-fall of *Berling's-Eau*, *Witham* continueth its winding Course to the Out-fall of *Tattershall-Bane*, which is
fourteen

fourteen Miles and a Half from *Berling's-Eau*; in this Distance the River collects the Waters of *Maiden Garth*, *Bardney-Beck*, *Southery-Wood-Dyke*, *Nocton-Dyke*, *Topham-Dyke*, *Dunn's Dyke*, *Berry-Dyke*, *Swine-Syke*, *New-Dale-Dyke*, *Billingshay-Skirts*, and *Tater-shall-Bane*; several of these are Waters of great Note, which are fed by large Springs, and receive considerable Quantities of the High-Country Waters in times of continued Rains; besides the Addition of what falls by Rains upon near twenty six thousand Acres on the South-side of *Witham*, and about ten thousand on the North.

From the Out-fall of *Tater-shall-Bane*, the River *Witham* continues its Curvilinear Course to a low Meer below *Chappel-hill*, and by the Way takes in the Waters of *Kime Ean*, which hath its rise about half a Mile above *Sleaford*, and besides it's own Springs, receives such additional Waters as fall into it in times of continual Rains.

N. B. *This Part of Witham from above Tater-shall to the said Meer below Chappel-hill, for about three Miles in length by Reason of the Lowness of the Land on both Sides, is here very Critical, and will require very strong and high Banks to confine the River Waters, and likewise several other Parts above towards Lincoln, will require Banking, and the River scouring out in several Places.*

From the Meer below *Chappel-hill*, *Witham* continueth its Course in an extraordinary

traordinary meandring Channel by *Swines-Booth* and several other *Booths* to *Langrike-Gote*, and from thence to *Langrike-Ferry*, *Armtree-Ferry*, and so on to *Anthoney's-Gote*, the Length betwixt the said Places, along all the winding Parts of the old River, is fifteen Miles; in this Distance the River is bounded on the one Side by *Holland-Fen*, and on the other Side by *Wildmore-Fen*. *Holland-Fen* before the Cutting of Lord *Fitzwilliam's* Drain, did issue its Waters into the River by *Langrike-Gote* and some others, which are now all landed up and of no Use, to the great Decay of the said River or Haven, above *Lodowick-Gote*. *Wildmore-Fen* did formerly drain by *Anthoney's Gote*, but since the building of *Maud-Foster's-Gote*; the Waters have a better tendency that Way, for which Reason *Anthony's-Gote* is quite landed up, and another near to it called *New-New-Gote*, and of consequence, according to the present Circumstances, will never answer the Expence of reinstating them. From *Anthony's-Gote* to *Boston-Bridge*, is three Miles and seven Furlongs, in which Distance the Haven receives the Waters that flow thro' *Peper-Gote*, and those that fall by Lord *Fitzwilliam's* Drain through *Lodowick-Gote*, which in great extreams of Wet, discharge large Quantities of Water into the Haven below.

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From *Boston - Bridge* to *Wiberton Roads*, along the Course of the Haven is four Miles, in which Distance there falls into the said Haven the Waters of the old and new *Hammond-Beck*, the *Land Eau*, or forty Feet Drain through *Redstone Gote*; these, when in a good State, were the Main Drains for Draining large Quantities of Land on each Side of 'em.

Below lieth *Maud Foster*, thro' which the Waters of *Skirbeck Wapentack*, below *Wildmore Fen*, &c. are drained with a very good effect. Further downwards falls in *Wiberton Sluice*, by which the Waters of the Parish of *Wiberton*, &c. are drain'd.

The River *Witham*, with all the aforesaid Branches, *Disembogue* their Waters into *Boston haven*, and from thence into the Sea at the *Scalp*, or *Boston Deep*s.

Having now traced the River *Witham* from its Head to its Out-fall into the Sea, and pointed out most of the additional Waters it receives by the Way, we shall in the next Place endeavour to show all the various States and Changes, both it and the Lands adjacent have under-gone, since the Year of our Lord 1047.

And first, we find from *Dugdale's Book* Page 168. of Imbanking and Draining, that in the 6th of *Edward the 3d*, *Henry de Fienton*, *William Disney*, and *Thomas de Sibthorp*, were then Constituted the King's Commissioners for Viewing the said River, betwixt the

Town of *Beckingham* and the City of *Lincoln*; and upon their View, did find that the said River Waters were turned out of their right Channel in sundry Places; and so obstructed with Sand, Mud, and Plantations of Trees; and also by Fludgates, Sluices, Mills, Cause-ways and Ditches, that the Course of the same being hindered, caused frequent Inundations to the Lands adjacent.

After this, in the 37th of *Edward* the 3d, there was a Presentment exhibited to *John de Repyngbale*, and *Henry Asley*, then the said King's Commissioners of Sewers sitting at *Newark*, upon *Monday* next after the Feast of *St. Laurence*, for the View of the said River *Witham*, in order to remove all Obstructions and Impediments from the Town of *Claypole* to the City of *Lincoln*; whereby the free Current of the Waters was hindered; which Presentment being made by the Jurors for the *Wapentakes* of *Boby* and *Graffow*, that the East Mill of *Bracebridge*, belonging to the Knights Hospitalers of *St. John of Jerusalem* in *England*, did stand in the right Course of the River, and very much Obstruct the Current thereof, to the great Damage of the King and Country, which was wholly owing to the Default of those Knights Hospitalers.

They farther presented that the said River had not sufficient Breadth and Depth, from the Sheepcote belonging to the Prior of *St. Katherine's*, unto the Bridge at *Bracebridge*;

bridge; and farther, that the said Knights Hospitalers had certain Floodgates there, which did turn the right Course of that River out of its proper Channel. Whereupon the Sheriff of *Lincolnshire* was commanded to Summon the Prior of the said Hospital of *St. John of Jerusalem*, to appear before the said Commissioners at *Newark*, the *Wednesday* next after the Feast of the Assumption of the *Blessed Virgin* then next ensuing, to Answer those Particulars. Anno 1078.

The said Prior did appear and alledge, that he and his Predecessors had been seized of the said Mill, Time out of Mind, as in the Right of their House; and as to the Floodgates, they had been erected there Time out of Mind also, but with this Proviso, that the Gates thereof should Yearly be remov'd, from the Feast Day of *St. Elene* in the Month of *May*, unto the Feast-day of the exaltation of the *Holy-Cross*; but that after that Day unto the Feast of *St. Elene*, they should stand in their Places. Page 169.

But if the said River of *Witham* should happen to Rise to such a Height, as to be above a certain Stake standing on the South side of the said Floodgates, then the said Gates were to be remov'd, until the Water should abate to the Height of the said Stake; and further, that the said Stake had been there placed for such a Gage Time out of Mind.

But upon a full Hearing of this Matter, before the said Commissioners at *Carleton*

in *Moreland*, on *Friday* next after the Feast of *St. John Baptist*, in the Year abovetaid; it was found by a Verdict of the Jurors, that the said Mill and Floodgates should be removed, and the Sheriff of *Lincolnshire* had command to remove them accordingly, and to make Certificate of his Doings therein, to the said Commissioners at *Sleaford*.

About two Years after this, was a Presentment made in the Court of King's Bench, that the Channel of *Witham* in *Wildmore* near *Coningesby*, was bending and defective, betwixt the said River and all Sewer called *Muardyke* in *Coningesby*; so that the Marshes in *Wildmore* and *Bolingbroke* were overflowed and drowned thereby; which was wholly owing to the Default of the said Town of *Coningesby*, which ought to Repair the same.

Anno 1737.

In the 1st of *Richard* the 2d, *William de Skipwith*, *Raplee de Threske*, *William Vincent*, and *William de Candelesby*, were constituted Commissioners for to View the Defects of a certain Ditch, lying betwixt *Snartford Bridge*, and the before specified River of *Witham*, and to enquire who ought to Repair the same.

Anno 1383.

And in the 6th of *Richard* the 2d, the King being informed hat the said River of *Witham*, as also hat of *Brant* and certain Ditches and Places, whereby divers Waters in the County of *Nottingham* and *Lincoln* did, and had used to

to run from the Town of *Claypole*, and so down by *Lincoln* unto the said River of *Witham*; but that now the said River was choaked up with Mud, and obstructed with the Planting of Trees, as well as certain Floodgates, whereby the Current of the said Waters were retarded to such a Degree, that the Lands, Meadows, and Pastures of divers Persons, had been very often overflowed, and did at that Time so continue; for which Reason the King assign'd *John Bussy*, *Henry Astley*, *Thomas Claymond*, and others, to View the same, and to make the said Channels and Ditches larger, so that they might be 30 or 40 Feet Wide betwixt the Banks, and 10 Feet in Depth.

In the 18th of *Richard* the 2d, *William* Anno 1395.
de Croseby, *John de Rochford* of *Boston*,
John dela Launde of *Pinchbeck*, *Thomas de*
Tofte, and *John Walleys*, were Commissi-
 oned to View and Repair those Banks and
 Sewers, betwixt *Hill-Dyke* and *Bullingbroke*,
 and betwixt the River of *Witham* and the
 Sea; and to do all Things therein, accord-
 to the Law and Custom of this Realm,
 and according to the Custom of *Romney*
Marsh: As also to take so many Diggers
 and Labourers, upon competent Salaries,
 in regard of the then urgent Necessity as
 should be sufficient to accomplish that Work.

So also in the 3d of *Henry* the 5th, Anno 1416.
Sir Robert de Wylughby, and *Sir Thomas de*
Wylughby, Knights, *John Cockayn*, *William*
de

de Lodington, *James Strangways* and others, had the like Commission for repairing all the Banks and Ditches, from the River to the Sea, and to proceed therein, according to the Laws and Custom of this Realm.

From the foregoing History it appeareth, that great Care and Pains hath been taken at several Times, to preserve the Waters within the Channel of the River *Witham*, from its Head to its Out-fall below *Boston*, as well as to drain all the Lands adjacent thereto, and that the said River hath, in ancient Times, been a very large and fine Navigation, in which Ships and Vessels of great Burden, have passed and re-passed betwixt *Boston* and *Lincoln*, as the Inhabitants thereof do by Tradition affirm: And it may be further proved by large Ribs of Vessels which have been digged up within the Memory of Men living in *Dugdale's* time. But the Reason of the Decay of so fine a Navigation, *Dugdale* ascribeth to the small Descent of the said River from *Lincoln* to the Sea, and the Crookedness thereof in some Parts, whereby the Waters have so slow a Passage, as not to be able to keep it wide and deep enough either for Navigation or Draining of the adjacent Marshes, without the frequent Helps of digging and clearing the same, of such Mud and Weeds, which by the Slowness of the Current, will of consequence grow and increase therein.

At

At the upper End of *Bradon* is *Fossdyke*, which hath a Communication with the said *Meer*, and the River of *Trent* at *Torksey*, and is about seven Miles in length; it is an artificial Trench that was made by King *Henry* the 1st, for the bringing up of navigable Vessels from the River *Trent* unto *Lincoln*; which, when compleated, had a very good Effect, both for the Purposes of Navigation, and Draining the Lands adjacent. But this Ditch was cut thro' so great a Flat, that it had no quick Current of Water thro' it, to scour out the Mud and Filth, which by little and little increased therein to that Degree, that within Thirty Years after it was grown so full of Weeds and Grass, for the Want of roading and cleansing, and the Earth so much troden into the same by driving Cattle over it in several Places, that the Citizens of *Lincoln*, as well in behalf of themselves Page 176. and other Tradesmen of the City of *York*, the Towns of *Nottingham*, and *Kingston* upon *Hull*, and several other Places, did in the 39th of *Edward* III. make a great Complaint thereof to the King in Parliament, representing the Damage which accrued to them thereby, in regard that Ships and Boats could not pass too and fro therein, with Merchandizes and Victuals as they had wont to do.

Whereupon the King constituted *Philip de Limbury*, *William de Shipwith*, *Adam de Limbury*

Limbury, Illard de Ufflet, Robert de Morton, and Walter de Poynton, or any four, or three, or two of them, to view the said Channel and the Defects thereof.

But these Commissioners did but little; for about ten Years after the Term being kept at *Lincoln*, the Jurors of divers Wapentakes in this County, did exhibit a Presentment in the Court of *King's-Bench*, importing, that the Channel called *Fossdyke*, extending itself from the River of *Trent* at *Torksey*, unto the City of *Lincoln*, having been antiently open and full of Water, so that Ships and Boats laden with Victuals and other vendible Commodities, did use to pass to and from *Nottingham, York, Kingston upon Hull*, and sundry other Places and Counties, by the said River of *Trent*, and so by this Channel to *Lincoln*, and from *Lincoln* to *Boston*, to the great Benefit of all the aforesaid Places.

But that it was now chok'd up for want of cleansing and repair; and ought to be reinstated by the Lords and Owners of the several Lordships that lay on either side, in proportion to the Quantity of their Lands abutting upon the same.

But notwithstanding this Presentment, the King did Issue out a Commission the very next Year, unto Sir *Michael dela Pole* Knt. Mr. *Jeffery le Scrope*, and *John de Stafford*, Clerk, to enquire touching the Obstructions thereof. But it doth not appear that it
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was then Cleansed, for in the 8th of *Richard II.* we find that *John Duke of Lancaster*, Page 168. *John, Bishop of Lincoln*, *Henry Percy, Earl of Northumberland*, *Sir Michael de la Pole, Knt.* *Sir Philip Darcy, Knt.* and others were appointed by the said King, to cause it to be Repaired and Scoured, so that Ships and Boats might have a clear Passage thro' it as antiently they used to do.

From this short History, as well as from the Survey, leveling Notes, and other Observation we have made upon the River *Witham*, and Lands adjacent, it appears self evident, that the Decay of the Navigation of the said River, and the bad State of the Lands adjacent, it is in a great Measure owing to the following Causes:

First, one great Decay of our Navigation and Draining, is owing to the bad State of the Banks on each side of the Rivers, &c. For of Consequence, where there are no Banks to confine the Waters within their Channels, they will flow over upon every rise of large Spring Tides, as well as in times of great Rains ; especially from below *Chappel-Hill* to above *Tatershall* along the River *Witham*, and likewise over the Banks of *Tatershall-Bane*, *Lime-Eau*, *Bilinghay Skirts*, &c. and thereby drown the Lands adjacent, as well as lose the greatest part of that Force they would acquire if confined in their Channels, to
drive

drive out the Sands brought up by the Tides.

Secondly, another Cause for the Decay of Navigation, is owing to the Cutting the forty Feet 'Drain thro' *Holland Fen*, for thereby a large Quantity of Water is diverted from the River or Haven above, to fall in at *Lodowick Gote*, where its Force and Effect will be in a great Measure lost, to what it would be if the said Waters were carried into the Haven, (or a new Cutt) somewhere betwixt *Chappel-Hill*, and *Langrike-Gote*, where the Fall for those Waters is the greatest: For of Consequence, the greater Quantity of back Waters any River receiveth, along that part which is the most subject to be landed up by the Tides, in proportion to the additional Quantity, will the Momentum, or Force be, to scour out the Sands or Silt subsided in the same.

Thirdly, the prodigious meandring Course of the River or Haven, from *Chappel-Hill* to *Anthony's Gote*, as well as the irregular Distances of the Banks from the Channel on each side all the Way, hath very much contributed to its present bad State; and likewise the many Defects in Draining and Navigation which have so often happened in the foregoing History; for of Consequence the Velocity of the back Waters are so much retarded by every Curve in the said River, all the Way down between
the

the aforesaid Places, that at the reflow of the Tides, the Waters at every Curve become so nearly Stagnant for some time, as to give Liberty for the Sands brought up by the Tides to subside in great Quantities, and thereby raise such Barrs as are now, and often have been, destructive to Navigation: Besides, those Barrs keep up the Waters so much above *Chappel-Hill*, as to cause them to overflow their Banks, and to drown the Lands adjacent; when Tides flow up or Freshes come down, which would be prevented in a great Measure if the said Barrs could by any Method be kept away; these Defects are in proportion greater or less, as dry and wet Seasons happen, and can never be perfectly remov'd, except it be by a new and strait Cut along the lowest part of *Wildmore Fen*, from *Chappel Hill* to near *Anthony's Gote*, instead of the present old and crooked Channel.

These being the chief Causes of the Decay of Navigation and Draining, upon the River *Witham* and Lands adjacent, we shall in the next Place endeavour to propose such a Scheme as may remove all the aforesaid Evils, and restore Navigation and Draining, to the greatest Perfection Circumstances will admit of: But before we enter upon that Work, it may not be thought amiss by Way of Lemmata, to lay down such universal Theorems, as are the Foundation of Draining and Navigation.

Theorem

Theorem I. From an actual Survey to draw Maps, and after that is done, to take the Levels, with such nice and accurate Instruments as may be depended on in Practice, of the Surface of the Lands, as well as the Bottom of all Rivers, Drains and Creeks, as shall come under our present Enquiries.

Theorem II. To find the Velocity of the Stream or Current of each River, &c. and by that the just Quantity of Water that can fall thro' the same, in any given time, according to any proportioned Capacity.

Theorem III. The natural direction of all Motion whatsoever is in a Right-line, and if any Force or Obstruction alters that Direction, in proportion to that Obstruction, &c. the Motion is retarded to what it was before the impress'd Force.

Theorem IV. The change of Motion produced in any Body, is always proportionable to the Force whereby it is effected, and in the same Direction wherein that Force acts.

Theorem V. Re-action is always contrary and equal to Action ; or the Action of two Bodies upon each other are equal, and in contrary Directions.

Theorem VI. Any two Motions or Forces when combin'd, have their joined force in the Direction of the Diagonal of such a Square which is formed according to their various Velocities and Directions.

Theorem VII. The

Theorem VII. The Motion of Water (as well as all other Bodies) along any manner of inclin'd Plane (whose Channel is regular all the Way) is continually accelerated by the Action of Gravity, but in a less degree, than when it descends perpendicularly ; and that in proportion, as the perpendicular Height of the given Plane is less than its Length, then consequently the longer the Course of the Current, and the greater the Descent is of such a regular Channel, the more the Motion is accelerated ; but in an irregular Channel, the longer it is, the more the Motion is retarded ; for every Curve in the Bank alters the Direction, and retards its Motion, and that in proportion to the Angles of those Irregularities.

Theorem VIII. All Rivers, &c. have equal Quantities of Water flowing thro' every part of them, from their Heads to their Outfalls in equal times, let them be regular or irregular, whilst they remain in the same State at their Heads, and have no other River falling into them by the Way ; for in all such Places, where the Waterway is confin'd in proportion, the Velocity is swifter than it is in those Parts where the River is more Broad or Deep and expanded.

Theorem XI. The Velocity of Water along two Planes of different Inclinations, but of the same Length, provided they be
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both equally regular along their Bottoms ; is in proportion to the different Heights of those Planes.

Theorem X. The Force or Strength of Motion, is according to its Velocity, and the Weight or Gravity of the Body moving, therefore the swifter the Motion, and the heavier the Body that moves, the more strong and forceable ; but the slower the Motion, and the lighter the Body that moves, so much the weaker and of less Force the Motion is : Then consequently the Velocity into the Quantity of Matter, is the Momentum, or Quantity of Motion.

Theorem XI. The same Water of any River doth continually change its Measure or Height, according as it altereth and changeth the Velocity of its Current, in the following reciprocal Proportion. As the Measure or Height of a River in one Part, is to the Measure or Height of the same River in another Part, so is the Velocity in the last Part, to the Velocity in the first Part.

Theorem XII. If several Rivers and Drains, empty themselves into one single River at any Distance from the Out-fall, in the most proper Direction, and that these several Currents have each of them the Height of their Waters and Inclination of their Planes, grater than the Main River into which they Disembogue themselves, the Velocity of the said Grand River will be

be increased by the Addition of the said Currents, in proportion to the quick Height of the Water at some small Distance from their Entrance, above what it was, before the Addition of those Streams; in a Reciprocal Proportion greater, as the Height of one Part is to that of the other; therefore as much as the Velocity is greater in the Main River, than the mean Velocity of the several Currents issuing into the same, in proportion the Land that drain by those Currents, will run off their Waters sooner than if each Channel had a separate Out-fall.

Theorem XIII. If any given Quantity of Water that flows thro' any River, be divided into several Channels, the Friction will be increased in one Case more than in the other, in proportion as the Sum of the Areas of the several Channels made up of the Bottoms and Sides, is greater then the Area of the Bottom and Sides of the single River; and the Force by which the Current of the single River acts with, to remove any Obstruction, is in Proportion greater than the divided Streams as the Momentum of the single River is greater than the Sum of the Momentas of the divided Streams.

Theorem XIV. If a River of any given Breadth falls into another of a larger Breadth, the Height of the first River in its own Channel will be to the Height it shall

make in the second Channel ; in a Proportion compounded of the Breadth of the second Channel, to the Breadth of the first ; and of the Velocity acquired in the second Channel, to that which it had in its first proper Channel.

Theorem XV. If any River when it is low, discharge a certain Quantity of Water in any given time, and afterwards there falls into it a Flood, the Quantity of Water discharged in the same time during the Flood, is to that which was discharged before the Flood : In a compound Proportion of the Velocity of the Flood, to the Velocity of the first Water, and of the Height of the Flood in the said River, to the Height of the first Water.

Theorem XVI. In all Channels that have Tides flowing up them, if the Inclination of such Rivers, and the Land on both Sides have a large Descent from the Inlands to the Sea, the best Method to keep open such Out-falls, is to let the Tides have free Liberty to flow up such Rivers to their utmost Extent ; for of Consequence, at the re-flow, the Tides and back Waters will be so much Accelerated in running down to Sea, as to have their Force equal to that of the Elow, and thereby the better keep open such Out-falls.

Theorem XVII. In all Rivers that are nearly Horizontal Planes up a great Distance into the
the

the Country, as well as the Land on each Side of the same; the best Method for preserving the Out-fall, is to Stem the Tides at such a proper Distance from the Sea by a Sluice or Lock, as appears the most eligible for preserving the Lands above from being over-flowed by the Tides; but this Distance must be determined from the Circumstances of the Place, and the Judgment of the Artift employ'd; for of Consequence, no general Rule can justly be come at, except it be to fix such Sluices or Locks, at a medium Distance betwixt the putting in of the Tides and their greatest Range up into the Country; Such stop Doors will have this Advantage, when there is a sufficient Quantity of back Water above, it may be let off when the Tides are quite ebb'd, and thereby have a very good effect in Scouring out the Out-fall; and at other times by setting the Doors open, the Tides may have Liberty to flow up the River above, and let off in the said Manner, if no Harm to the Country is sustained thereby, without such stop Doors, the Tides will flow up the Country farther than where they have up hill to Surmount, and that in proportion to the Inclination and Irregularity of such Planes; and at the reflow, the back Waters will move so Dead and Languid after the Tides, as to have little or no effect in scouring
out

out the Channel below, except in great Extrems of high Country Floods.

Theorem XVIII. By several nice Experiments that have been made by Mathematicians, and other ingenious Members of the *Royal Society*, it hath been proved, that the Rains that fall in the greatest Extream of a wet Year (supposing our Island a flat Plane) would cover the Surface to the Height of about 30 Inches, and of Consequence that one third of the said Waters are exhal'd off by the Sun and Wind ; one third are retained in the Earth for the Use of Vegetation, and another third part to supply the Springs and Rivers, &c. It is farther proved that two Thirds of the Rain generally falls in the Winter Half Year, when there is but a small Quantity evaporated by the Sun, by reason of the Obliquity of its Rays ; for which Reason there is but one Third during the Winter half Year wasted by the Earth and Exhalation ; and the other two Thirds run into the Rivers, and are by them convey'd to Sea.

These Theorems being the Foundation of Draining and Navigation, we have thought it proper to insert them here, in order to refer to, as Occasion may require, and thereby demonstrate the Possibility of our following Scheme.

A SCHEME

*A S C H E M E for the Restoring and
making perfect the Navigation of the River
Witham, from Boston to Lincoln, &c.*

TH E R E are three different Ways offer themselves, for restoring the Navigation of the River *Witham*, between *Boston* and *Lincoln*.

The First is, to scour out the Old Channel, from above *Anthony's Gote* to *Chappel - Hill*, which is fifteen Miles in Length along the winding Course of it ; and according to its present bad State, it will require to be forty Feet broad at the Top of the present Core, twenty Feet at the Bottom, and at a Medium, five Feet deeper than now it is, and the Earth to be laid on the old Banks where they are not at too great a Distance, and in those Parts where they are, the Earth must be laid on both Sides in Bank Fashion, at twenty Feet distance on each Side from the Brink of the River.

One Rod of this Work will contain 7. $\frac{1}{2}$ Floors of Earth, which at three Shillings per Floor, Barrowing Work, will cost twenty two Shillings and six Pence per Rod, and for one Mile near three hundred Pounds: Hence the fifteen Miles will cost Four thousand five hundred Pounds.

The Second Scheme is to scour out the old River in those Parts that are most regular, and to desert it in the greatest Curves,
by

by cutting through the Lands as straight as Circumstances will admit of; and as
** See the Map.* it is Represented by R, S, T, V, W; * the River being reinstated in this manner, betwixt *Chappel-Hill* and *Anthony's Gote*, will be seven Miles and three Furlongs: and for Digging, Barrowing, and laying the Earth on each Side, Bank fashion, at full twenty Feet from the Brink of the River, at the aforesaid Rate, will cost Two thousand two hundred eleven Pounds, seven Shillings, and six Pence; but the Cut thro' the old Bank, and landing up the old River, in all such Parts where unavoidably it will be crossed, will cost about Five hundred Pounds more. Hence the Whole of this Scheme will amount to Two thousand seven hundred eleven Pounds seven Shillings, and six Pence.

The Third Scheme we propose, will be to make a new Cut from *Chappel-Hill* to near *Anthony's Gote*, along the lowest Part or Slade of *Wildmore Fen*, which from our leveling Notes, we find to be nearly in the Direction of A, B, C, † this new Cutt is but seven Miles in Length, and to be of the same Capacity, and the Earth to be laid at the same Distance, &c. as in the last Scheme, it will cost Two thousand one hundred Pounds.

The River and Banks above *Chappel-Hill* to the *Bradon* above *Lincoln*, will want to be Repaired in any one of the aforesaid

aforesaid Schemes, according to the following Method.

As First, it will require to be made Deeper for about three Miles and a Half above *Chappel-Hill*, in such degree as to answer to the Depth below, and with the Earth taken out to make part of the Banks on each Side at the same Distance as aforesaid, and with additional Earth from the Lands to compleat the said Banks.

This Work will Cost about Three hundred twenty Pounds per Mile, and for the three Miles and a Half, One thousand one hundred and twenty Pounds.

To Dyke out all the shallow Parts of the River above the last mentioned Place, as far as the *old Stanch* near *Lincoln*, will cost Four hundred Pounds; And to Dyke from the said *Stanch* thro' the Town of *Lincoln*, as far as to the *Bradon*, two Feet Deeper than now it is, and of the same Breadth, will cost about Two hundred seventy five Pounds.

From the leveling Notes it further appears, that there will be a Necessity to erect 2 Stanches, one a little above the Out-fall of *Tatershall Bane*, as represented at Q; * and * See the Map. the other about the 159th Station; which to perfect, will cost about 500 Pounds.

Add to this for Supervising the Works, and unforeseen Accidents, Three hundred Pounds. Hence the whole Charge of compleating the Navigation, from
Chappel-

Chappel-Hill to the *Bradon*, amounts to Two thousand five hundred ninety five Pounds.

By the aforesaid Calculations it appears, that to compleat the Navigation betwixt *Boston* and *Lincoln*, in the most effectual Manner, by the proposed new Cutt, &c. along *Wildmore Fen*, will cost Four thousand six hundred ninety five Pounds.

And to compleat it, by reducing the old River, to as near a strait Course, as Circumstances will admit of, &c. will cost Five thousand three hundred six Pounds, seven Shillings, and six Pence.

But to compleat the said Navigation, according to the first Method of Dyking out the old River, &c. will cost Seven thousand and ninety five Pounds.

The Dyking out the old River, according to the first Proposition, besides the Greatness of the Charge, it will always be liable to Silt and Land up again in all dry Seasons, on the Account of the crookedness of its Course, which may be proved by Proposition the Third, Fourth, Fifth, Sixth, and Seventh, before recited.

And to Dyke it out according to the second Proposition, it will be attended with many Difficulties in Cutting thro' Banks, and crossing the old River in several Places, &c. And when Completed, it will have some curv'd and irregular Parts in it, contrary to the Laws of Motion,

tion, which may be proved by the aforesaid Propositions.

Hence of Consequence, the third Proposition must be most inviting, not only on Account of its being less Expensive, but the most agreeable to the Laws of Motion, and thereby not so liable to Silt up, as in either of the other Methods ; therefore, we may justly Conclude this third Scheme the most assisting to Nature, the best for Navigation, and the most Eligible in Draining ; which may be Demonstrated by most of the eighteen Propositions before going.

A SCHEME for Restoring the Navigation of the ancient River Witham, from Boston into the Bradon above the City of Lincoln, and for the more effectual Draining of the Parishes and Fens on each side, adjacent to the said River, as far as they have come under the Limitations of our Contract.

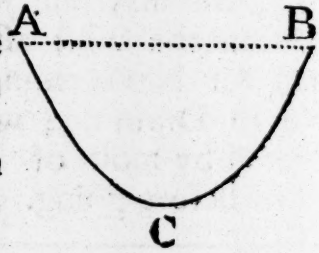
IN the drawing up of this Scheme, the draining of large Tracts of Land thro' the said River is to be considered, as well as the Navigation thereof ; which of Consequence will oblige us to enlarge the Capacity of our main Channel, in proportion to the

the Water she is to receive, more than if Navigation was only considered.

Therefore, as the New Cutt from near *Anthony's Gate to Chappel-Hill* in the Direction A, B, C ; * will be the least Expence, and most eligible for draining, as well as Navigation ; it will be required to have the Capacity so much

Note that one Rod is twenty Feet in length, and one Floor of Earth four hundred solid Feet.

enlarged as to be seventy Feet broad in the Top, and at a Medium six Feet deep below the Surface, and its Section to be in the Form of a *Parabola*, as shown in the Margin A B C, one



Rod of this River will contain fourteen Floors of Earth, which must be barrowed and laid at thirty Feet Distance from the Brink of the River, Half on the one Side, and Half on the other, in due Form and Batter according to a Section agreed upon. Hence each Bank will contain seven Floors in each Rod forwards ; and one Rod of the River and Bank at the rate of three Shillings *per* Floor will cost forty two Shillings, which is five hundred fifty four Pounds eight Shillings *per* Mile, and for the whole Length (which is seven Miles) near three thousand eight hundred eighty one Pounds. A River dug out according to the said Section, will be the best adapted for increasing the Velocity of its Current,

when the Waters in it are low as well as most properly expanded for receiving the Waters in times of Floods, and consequently will stand longer, and not land up so soon, as if made with a square Bottom.

For about three Miles and a Half above *Chappel-Hill*, the River will require to be dug deeper, and answerable to the New-cutt below, the Earth that is taken out to be laid on each Side at the same Distance from the River as aforesaid, and more Earth taken from the Lands to compleat the Banks on each Side, so as to have about five Floors in each Rod forwards; at this Rate, the three Miles and a Half will cost one thousand four hundred Pounds.

Likewise to dyke out all the shallow Parts of the River above the last mention'd Place, as far as to the old *Stanch* near *Lincoln*, and to raise all the low Parts of the Land on both Sides, proportionable to the high Parts, will cost one thousand Pounds.

And to dyke from the said *Stanch* thro' the Town of *Lincoln*, as far as to the *Bradon* two Feet deeper then now it is, and of the same Breadth, will cost two hundred seventy five Pounds.

From the leveling Notes it further appears that there will be a Necessity to erect two *Stanches* a-cross the River, one a little above the Out-fall of *Tatershall-Bane*;

as represented at Q; and the other about the 159th Station; these *Stanches* will be of great Service, in keeping up the Waters above in dry Seasons, both for Navigation and the use of Stock; and to compleat it will cost Five hundred Pounds.

Add to this, for supervising the Works and unforeseen Accidents, four hundred Pounds.

Hence the whole Charge of compleating the River from *Boston* to *Lincoln*, so as to be the most perfect for Navigation and Draining, will cost seven thousand four hundred fifty six Pounds.

Having now laid down such a Capacity for the Main River, as to us seems the most eligible for receiving the Waters of the Lands adjacent, in times of great extreams of Wet, and for the conveying of them to the Sea with the greatest Velocity: We shall in the next Place endeavour to point out from our levelling Notes the most proper Places for the Cutting of new Drains, or reinstating such old Ones, where the greatest Descent lieth for the more readily discharging the Land-Waters into the Main River: And,

First, it appears from our Survey, that all the Low-lands on each Side of the River from *Lincoln* to *Wasphenburgh-Beck*, and *Fiskerton-Dyke*, will drain into *Witham* by their own Dykes and the said Becks, if they be kept open and in good repair;
to

to effect which may cost three hundred Pounds.

Secondly, It farther appears, that the greatest Slade for draining all the Parishes from *Wasbenburgh* Lordship, to the Out-fall of *Kime-Eau*, lieth nearly in the Direction of G, F, E, D. *

* See the Map.

Hence if a new Drain be cutt from near the five Mile Trees, along the Parishes as it is represented in the Map, and to fall thro' the subterraneous Tunnel under *Billinghay-Skirts* and from thence down the twenty Feet Drain into *Kime-Eau*, and with those Waters into the grand new Cutt below *Chappel-hill*, it must of consequence have a very good effect, for draining all the Lands of every Parish betwixt it and the Parts above; and by laying all the Earth on that Side next to the River, in due Bank fashion; it will not only drain the said Lands, but serve as a Catch-Water Drain, for the high Country Waters in times of great Land-Freshes.

This said Drain is fifteen Miles and a half in Length, and ought to be thirty Feet broad at the Top, fourteen Feet broad at the Bottom, and at a Medium five Feet deep below the Surface; in one Rod there will come out five Floors and a half, which at two Shillings per Floor, half casting and half barrowing Work, will cost eleven Shillings per Rod forwards, and for

for one Mile at a round Sum, one hundred forty five Pounds, and for the whole Length two thousand two hundred forty seven Pounds ten Shillings.

And to reinstate the subterraneous Tunnel under *Billinghay-Skirts* may cost two hundred Pounds.

Likewise all the boundary Ditches and Drains from the new Drain, to the *Carr-Dyke*, ought to be put in a good State, so as readily to bring down the Waters into the said Catch-Water-Drain ; to perform which, will cost two hundred Pounds.

Thirdly, All that side of the Parishes betwixt the new Drain and the *Witham*, will readily drain into the said River, by their own boundary Dykes, *Nocton-Dyke*, *Dunn's-Dyke*, *Billinghay-Skirts*, and *Kime-Eau*, if they all be properly reinstated, and strong Banks on each Side of the larger Drains ; the Charge of the said Works will amount to one thousand four hundred Pounds.

Fourthly, *Kime-Fen*, and a large Part of *Holland-Fen* seem by this Scheme, to have their most natural way of draining by *Kime-Eau*, *Hubbard-Syke*, and *Langrike-Gote* ; but the reinstating of *Kime-Eau* is already estimated ; hence the Expence of repairing of *Hubbard's-Syke*, and *Gill-Syke*, with their new Drains into the grand River, at N and M, will amount to seven hundred Pounds.

By

By this Scheme that Part of the forty Feet Drain, between L and P, may wholly be deserted, and a new one carried out from it in the Direction of P, O, * in order to take off those Waters that will not so naturally fall into the aforesaid Drains: Another Drain may be cutt nearly in the Direction of V, W, to fall into the forty Feet, and be continued on, in the most useful Direction, for draining those Fens and Lands lying towards *Swineshead*; these Drains may be compleated of the same Dimensions as the catch Water Drain: Casting Work on both Sides with a four Feet Sess, at ninety three Pounds *per* Mile. By this addition, *Lodowick Gote* will still be of excellent Use for the discharging of these Waters.

* See the Map.

Thus have we laid down such Rules for the more effectual Draining the Lands, on the South-side of *Witham*, as to us hath seemed the most Reasonable; we shall in the next Place endeavour to lay down the most eligible Methods for Draining of those on the North-side.

And *First*, we find that all that narrow Tract of low Land, from *Fiskerton-Dyke* to the Out-fall of *Berling's-Eau*, as well as all the Lands on each Side as far as *Berling's Abby*, will drain by their own *Dykes*; and the said *Eau*, provided they be properly scoured out and banked on

D

each

each Side, and to compleat the said Work, will cost Two hundred and fifty Pounds.

Secondly, All the low Lands from *Berling's-Eau*, to *Topham Dyke*, we find from our Survey, have a natural tendency to drain into the *Witham*, by *Maiden Garth*, *Bardney Beck*, *Southery Wood Dyke*, and *Topham Dyke*, but they all want to be scoured out, as well as the leading *Dykes* into them, and to do the said Work as it ought, will cost Three hundred fifty Pounds.

Thirdly, From *Topham Dyke* thro' the Parish of *Stixmold*, to the Out-fall of *Swines Syke*, the Lands have a good Fall to the River, and will readily drain by their own leading *Dykes*, and *Swines Syke*, This said *Syke* is very well adapted for draining the low Parts of the Parishes of *Stixmold*, *Eddlington* and *Thimblebe*, when put in a good State, to effect which, will cost Three hundred forty Pounds.

Fourthly, From *Swines Syke*, along the Parish of *Kirkstead*, the Lands are very low and flat next to the River, as far as to *Tatershall* Lordship, and have no Way for running off their Waters, but by their leading *Dykes*, which can no Ways be effected in Times of Flood, till they are fallen, without the Help of an Engine, which will cost about One hundred fifty Pounds.

Fifthly,

Fifthly, The like Complaint we have to make against about Seven hundred Acres of Land, lying in the Lordship of *Tatershall*, whose leading Drains are *New Dale Dyke* and *Tatershall Bane*; and the most effectual Method for securing that Part, will be by scouring out the said Drains in such Perfection, as to have Earth to make proper Banks on each Side of them, and to erect an Engine in the lowest Part, so as to throw its Waters into *Tatershall Bane*, the Repairing the Drains and Banks will cost Five hundred Pounds; and a twenty six Feet post Engine, and fifteen Feet Diameter Water Wheel, will cost near Two hundred twenty Pounds: Hence to compleat the Draining of this Parish, will cost Seven hundred twenty Pounds.

Sixthly, There will be a Necessity for the following stop Sluices, with pointing Doors next to the River, one to be placed at the Out-fall of *Kime Eau*, the Second at the End of *Tatershall Bane*, the Third at the Out-fall of *Billinghay Skirts*, and the Fourth at the Mouth of *Newdale Dyke*, in order to keep out the Tides, and high Country Floods, when the Water in the main River over rides those in the said Drains; to compleat all these Sluices effectually, will cost fourteen hundred Pounds.

Seventhly, That part of *Wildmore Fen*, whose Waters will have a better Tendency

cy to drain by the new Cutt, sooner than by *Maud Foster Gote*, will have the best
 * *See the Map.* Fall into the said Cutt at B and b,* and by one or two Twenty Feet Drains, which to effect, will cost fifty three Pounds for each Mile.

Lastly, it may be Objected, that we are very Defective in ascertaining the Length of such Drains, we have pointed the Outfalls of in *Holland*, and *Wildmore Fens*, as well as the Lands they ought to be Cutt through, and Quantities that may Drain by them. And likewise, that we have omitted giving in a System, for the better draining all that large tract of Land, called *Hauthauntree Fen*, and those between the River *Glen* and *Car Dyke* as far as to *Bourne*; but as the Bounds of these Fens, are not inserted in Mr. *Pitchford's Map*, nor any actual Survey taken of them, or the Levels of their leading Drains, by which the Waters are to be discharged, it will be impossible for us to determine the Charge for draining of them, with the same Certainty as we hope we have done in the foregoing Scheme. But if the Proprietors of those Lands are desirous of joining in this laudable Work, such Surveys, Levels, and Estimations may be taken, as will Ascertain the best Method, and most easy Charge of draining those Lands, without any loss of Time
 in

in the Executing the other Parts of this Scheme.

	l. s.
To reinstate the River <i>Witham</i> in such a Manner as to serve all the Purposes of Navigation and Draining in the best Manner, will cost	7456 00

To the Works of Draining all the Parishes and Fens, that are here Estimated, will cost	8257 10
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To Supervising the Works for Draining and unforeseen Accidents.	486 10
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£. 16,200 00

A N N O T A T I O N S

A N N O T A T I O N S *on the* *foregoing* S C H E M E.

IT hath been doubted, whether a *Staunch* placed at Q, will answer all the purposes of Navigation desired, betwixt *Boston* and *Lincoln*, when the new Cutt is made, and the River above the *Staunch* Repaired, as proposed in the foregoing Scheme.

But by the levelling Notes at the 184th Station, represented by A; it appears that betwixt *Lincoln* High-Bridge, and the proposed *Staunch* at Q, the Bed or Bottom of the River is lower at the *Staunch*, then at *Lincoln* High-Bridge, by 8½ Feet: And farther, that the Bars of Sand in the old Haven below *Chappel-Hill*, kept up the Waters so high at Q, as to be four Feet in Depth, when we took the Survey.

But when the new Cutt is made, as proposed, and all the Shallows in the River from Q to *Lincoln* High-Bridge, are Dug out to such a proper Depth, as to have every part of the River from *Lincoln* to the *Staunch*, at least 2 Feet 6 Inches deep in Water, when it begins to run over, or through the Gage Doors of the said *Staunch*; of Consequence, that part of the River near to *Lincoln*, would be almost Dry, if the *Staunch* be drawn and left open, except in times of great Rains and Floods, but by shutting or letting
down

down the *Staunch* Doors, the Waters above it, may be kept up in all dry Seasons to the same Height they were at, when we took our Survey, and the waste Water will run over or through the Gage Doors; by this Method, a sufficient Quantity of Water may always be preserved above the *Staunch* to *Lincoln*, fit for Navigation in the driest of Seasons, and in Times of the largest Freshes coming down; if the *Staunch* be drawn quite Open, the Waters will have the same Scope to run off, as if no *Staunch* had been erected there.

But in Order to remove all manner of Doubts that may be raised against one single *Staunch* at the 93d Station, if it be found in Practice, that the said *Staunch* will not keep up the Waters betwixt it and *Lincoln* High - Bridge, so high in every Part, as we have endeavoured to prove, by the foregoing Annotations, another *Staunch* may be Erected at the 159th Station, to keep up the Waters 5 Feet 2-Inches there, hence of Consequence, by this Second *Staunch*, the Waters above may be kept up all the Way, so as to be 4 Inches deep at *Lincoln* Bridge; and in every other Part, from thence to the *Staunch*, at the 159th Station, of the same Depth they were when we took our Survey, without deepening the River at all, which is easily proved by the levelling Notes; Therefore, if all the
Shallows

Shallows represented by the levelling Notes, are Dug so much deeper betwixt *Lincoln* Bridge and the said *Staunch*, as 2 Feet at a Medium, which will require more in some Parts, and less in others, as the Shallows are greater or less, to compleat the Depth of $2\frac{1}{2}$ Feet Water in every Part along the said Distance ; hence it will appear self Evident from the levelling Notes, that if the Surface of the Water betwixt the aforesaid Distance, was an entire Horizontal Plane, when Level with the Top of the said *Staunch*, yet there would be $2\frac{1}{2}$ Feet Water in Depth all the Way, before it could run over or through the Gage Doors of such a *Staunch*.

From the like Way of Reasoning it will appear, that if all the Shallows between the aforesaid *Staunch*, and that at the 93d Station, are Dug so much Deeper as the levelling Notes direct ; more than 2 Feet and a half Water, may constantly be kept up betwixt the two *Staunches*, when they are both Shut.

This Second *Staunch* will be no more Hindrance to Draining, then if there was only one at the 93d Station, for when large Freshes come down, the said *Staunch* may be drawn or set open, in the same Manner as the other, and thereby give the Water the same Freedom to run off, as if no *Staunch* at all was Erected there,

The

The Water in the new Cutt below the *Staunch*, as may be proved from the levelling Notes in the Map, will always be one Foot 2 Inches Deep, when its Surface is in a Horizontal Plane with the Surface of the Waters at *Boston* Bridge, at low Water Mark : Therefore, if we add to that Depth near to the *Staunch*, the waste Water that will run Over, it will appear from the constant Laws of Motion, that it must Rise more than 1 Foot there, to preserve its future Current through the new Cutt below ; therefore, if we take 2 Foot 2 Inches, the Height of the Water on the South East Side of the *Staunch*, from, 6 Feet 2 Inches on the North West Side, (for the River above the *Staunch* is to be Deepened two Feet) the Fall betwixt one Side and the other, can never exceed 4 Feet in dry Seasons, and at a dead Neap ; and this Fall will be always diminished in Spring Tides, in proportion, as they are greater or less. We have further proved from Experience, that when the Fall will be the greatest, upon opening the moveable Part of the said *Staunch*; the Waters will be so nearly Level, on both Sides, in about 4 Minutes Time, that Vessels may safely pass and re-pass without any Danger.

It has likewise been asked, whether this new Cutt will not be liable to Silt up by the Tides, except a large Sea Sluce be erected

erected at its Mouth, near *Antony's Gowt*, in order to Stem the Tides there.

To this, we Answer, that if a Sea Sluice was to be Erected there to Stem the Tides, of Consequence, they would still flow up the old Haven to *Chappel-hill*, and for the Want of a back Force, they would in a few Years land up the old Haven, above the Rise of the greatest Tides, and make it Marsh Land, as hath been the Case at *Chester*, since the new Cutt was made.

After this, the Tide being stopt in its flow so near to the Out-fall, would have a very bad Effect thereon, by Lodging the Sands it brought up in such Parts of the expanded Bay, where the Force of its Current became the most Languid: Instances of this kind have been prov'd by *Denvoir Sluice*, and all others that have been placed too near to the Sea in the Tide way, as well as such Practice condemn'd, by most of the best Authors that have Wrote upon this Subject, particularly in the History of Navigation and Draining, wrote by the ingenious Mr. *Badeslade*.

Again, if we suppose no such Sluice to be Erected, but the new Cutt to be left open quite to the *Staunck*, it will fill up less, than in any other Scheme, on account of its being the shortest Distance and the nearest to a right Line, of any other that can be made, where there is
so

so good a Fall ; therefore it must be the most agreeable to the Laws of Motion, both for Navigation and Draining.

It hath been further proposed, whether it would not be more practicable and a less Expence, to carry Navigation and Draining along the Forty Feet Drain, and to enter the old River a little above the Out-fall of *Billingham-Skirts*, and to fall into the Haven, at *Lodowick Gote*.

But first, if we consider Navigation only, it will appear from the Map, that the Distance is greater by near 3 Miles and 3 Quarters, than along our new proposed Cutt, and much more Irregular, besides, the Surface of the Land by the Sides of it, are for the most Part higher then where our Cutt is proposed by one Foot 9 Inches, as will be made manifest by the levelling Notes, hence of Consequence, to Navigate this Way, will require a very strong and large Lock, with the Addition of so many Side draw Doors, to make it at least 60 Feet Water way, to answer the end of Draining as well as Navigation ; add to this the Scouring out and cutting thro' the solid Earth, in order to make a Communication with the River, and it will easily be proved by those that are capable of making a just Estimate of this Work, that such a Scheme will cost more than our new Cutt thro' *Wildmore Fen*,

Fen, and when done will not be so easy and lasting a Navigation ; besides, the same Objections we have raised against a Sluice being placed at the Mouth of our new Cutt, may very justly be proposed against a Lock at *Lodowick Gote*.

Secondly, If universal Draining as well as Navigation be consider'd, the Objections against the Forty Feet are the more stronger, and the Consequences of such a Work the more Fatal ; for in all Times of great Rains and Freshes coming down, the Waters in the Forty Feet will so much Over-ride those in *Wildmore-Fenn*, and the Low Parishes above and adjacent thereto ; as wholly to deprive them of the Benefit of Draining that Way, till the said Lands are near two Feet under Water.

And if these Lands are supposed to drain by *Anton's-Gote*, or any other Course on that side ; the Force and Effect of those Waters will be wholly lost with regard to the forty Feet Drain, and thereby prevent its Current of that additional Swiftnes the Waters will receive by running through our new Cutt ; it farther appears, that a Lock at *Lodowick's-Gote* without such additional draw Doors as before-mentioned, will so much contract the Capacity required for general Draining, as not to be capable of doing that Office in double the Time it will be effected by our New-Cutt : For these Reasons we quite rejected the

the forty Feet Drain in our Scheme, from being the most eligible for Navigation and Draining.

Thirdly. To prove that the Parishes and Low Lands on the South side of the River *Witham*, will be the most perfectly drain'd by our New proposed Catch-Water Cutt, will require no more then a simple Addition and Substraction, of some few of the levelling Notes, as will plainly appear by this universal Therom.

Take

Take the Sum of the levelling Notes and depth of the Water at any one Station proposed in the River, and likewise the Sum of the levelling Notes and depth of the Water at any other Station in the River, you have made a Tower From, into the Land to any Point in Question, subtract one from the other, and note the Difference, and if both the Station in the River you towered from and the Station you towered to, are higher, or lower than the Station below in the River; add the Station by Land to the Difference, and that Sum will be the Rise or Fall, with regard to the Surface of the Water in the River at the first Station proposed: But if the Station of the Land is

lower

F. I.

14,, 1. 2. at the 9th Station
4,, 0. 0. at D^o

18,, 1. 2. Sum

and 13,, 10. 0. at the 11th Stat.

3,, 11. 0. at D^o

17,, 9. 0. Sum

lower than that in the River, you towered from, and is higher than the first Station proposed, subtract it from the Difference of the other two, and the Remainder will be the Rise or Fall, of the Surface of that Point, with Regard to the Surface in the River, &c. An Example you have in the Margin in Figures, which in our Case the Surface of the Land at the 6th Land Station in blankney Lordships, by the Catch-Water Drain, is lower then the Surface of the Water above the *Staunch* by 8 Inches, which being subtracted from 4 Feet, the Fall betwixt one side and the other, and it will be found that the Surface of the Land at the said Point will be higher, then the Surface of the Water below the *Staunch*

hence

18,	1.	2.	Sum at 93d Stat.
17,	9.	0.	Sum at 119th Stat.
0,	4.	2.	L Note
0,	3.	8.	at 6th Stat. by Land
0,	0.	8.	Inches lower
4,	0.	0.	Fall at the <i>Staunch</i>
0,	0.	8.	subtracted
3,	0.	4.	the Fall.

By 3 Feet 4 Inches: By repeating the
same *Theorem* for any other Part you may
readily know the Rise or Fall of it, with
regard to the Surface of the Water above
the *Stanch*.

By such Operations it will be found that G. F. E. D. &c. is the very best
Part that can be fix'd upon for a Drain, to discharge the Land Waters in the shortest
Time, into our new Cut, at A. and by repeating the said *Theorem* for the Low-
Land on the North-side the River, it will be found that what we have propos'd
to drain those Lands is equally as just and Eligible, and since there can be
but one best Way at coming at such Truths in Question, we humbly hope that
at the present we have bid the fairest for it.

J. GRUNDY, Sen. and Jun.

F I N I S.

By a Foot & Incheer By repeating the 1